

P A T E N T C L A I M S

1. A method for producing substantially monodisperse micro particles, preferably of a heat sensible material, said method comprising at least the steps 5 of:

feeding a feed material to at least one orifice, said feed material comprising a solution or dispersion or suspension,

10 ejecting the feed material from the orifice as single micro spheres having diameters of substantially the same size,

characterized in that the micro spheres 15 ejected from the orifice is subjected to a stream of a carrier gas encircling the orifice, carrying the micro spheres onwards into a drying chamber, where the micro spheres is further subjected to a drying gas causing evaporation of the volatile liquid and 20 drying of the micro spheres into solid particles in the drying gas in the drying chamber.

2. A method according to claim 1, wherein the temperature of the carrier gas in the area in front of the orifice is lower than the temperature of the drying gas in the drying chamber.

3. A method according to claim 1 or 2, wherein the inlet temperature of the carrier gas is in a range below 40°C, preferably in a range below 25°C.

4. A method according to any one of claims 1 to 3, 30 wherein the inlet temperature of the drying gas is in the range from 25 to 250°C, preferably in the range 30 to 120°C, and more preferably in the range from 40 to

80°C.

5. A method according to any one of claims 1 to 4, wherein the drying gas is introduced into the drying chamber at an area below the area where the carrier 5 gas is introduced.

6. A method according to any one of the claims 1 to 5, wherein the velocity of the carrier gas is less than 50 m/s, preferably less than 10 m/s.

7. A method according to any one of claims 1 to 6, 10 wherein the carrier gas disperses the generated micro spheres into the drying gas.

8. A method according to any one of claims 1 to 7, wherein the carrier gas encircles the orifice in a swirling motion.

15 9.. A method according to claim 8, wherein said swirling motion has a swirl number > 0,5, and preferably a swirl number > 1, more preferably a swirl number > 2.

10. A method according to any one of claims 1 to 20 9, wherein the flow of said drying gas includes a substantially laminar flow in the drying chamber.

11. A method according to claim 10 wherein the velocity of the substantially laminar flow is < 0,5 m/s, preferably < 0,3 m/s.

25 12. A method according to any one of claims 1 to 11, wherein an oscillating device acts on the feed and/or on a feed device having said orifice located at a delivery end.

13. A method according to claim 12, wherein the 30 oscillating device includes one or more piezo electric crystals.

14. A method according to any one of claims 1 to

13, wherein the carrier gas and the drying gas are selected from atmospheric air, nitrogen, argon, helium, carbondioxide, optionally sterilised and mixtures thereof.

5 15. A method according to any one of the claims 1 to 14, wherein the carrier gas is a saturated gas.

16. A method according to any one of claims 1 to 15, wherein the yield of heat sensible material is higher than 90%, preferably higher than 95% of the
10 theoretical yield.

17. A method according to any one of the claims 1 to 16, wherein the particles have a particle size distribution with a span < 0,5.

18. An apparatus producing substantially monodisperse micro particles, preferably of a heat sensible material, and comprising a drying chamber having at least one inlet for a drying gas, and at least one feed device with an orifice for ejecting micro spheres one by one, characterized in
15 that the feed device has a feeding end for receiving feeding material and a delivery end with an orifice for ejecting micro spheres of feeding material, that the feed device is surrounded by an outer tube with
20 an air gap between an outer surface of the feed device and an inner surface of the tube, and at least one inlet for carrier gas to said air gap.
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19. An apparatus according to claim 18, characterized in that the feed device includes a oscillation device capable of generating mutual os-
30 cillation between the feeding material and the feeding end of the feed device.

20. An apparatus according to claim 18 or 19, characterized in that the oscillation

device includes oscillating means in the form of one or more piezo electric crystals.

21. An apparatus according to any one of claims 18 to 20, characterized in that the feed device in the tube is mounted in an upper end wall of the drying chamber with a longitudinal axis of the tube extending in parallel with a longitudinal axis of the drying chamber, preferably coaxially therewith.

10 22. An apparatus according to claim 21, characterized in that at least one inlet for drying gas is located at a level below the orifice at the delivery end.

15 23. An apparatus according to any one of claims 18 to 22, characterized in that the apparatus comprises a plurality of feed devices for generating micro spheres, preferably 2 to 8 feed devices arranged in the upper end wall of the drying chamber.

20 24. An apparatus according to claims 22 or 23, characterized in that the diameter of the drying chamber is increased at a level below the inlet for drying gas.

25 25. An apparatus according to any one of claims 18 to 24, characterized in that the volume of the drying chamber is less than 0.10 m³, and preferably larger than 0.03 m³, when the produced particles have a mean particle size in the range of 1-59 μm.

30 26. An apparatus according to any one of claims 18 to 24, characterized in that the volume of the drying chamber is less than 0.30 m³, and preferably larger than 0.1 m³, when the produced particles have a mean particle size in the range of 60-120 μm.

27. An apparatus according to any one of claims 18 to 26, characterized in that the at least one inlet for carrier gas is arranged to supply carrier gas with a velocity of less than 50 m/s, 5 preferably with a velocity of less than 10 m/s.

28. An apparatus according to any one of claims 18 to 27, characterized in that the at least one inlet for carrier gas is arranged tangential to the longitudinal axis at a position between 10 the feeding end and the delivery end of the feed device.

29. An apparatus according to any one of claims 18 to 28, characterized in that the at least one inlet for carrier gas is connected to a gas 15 supply device providing an inflow of carrier gas to the air gap resulting in swirling motion of the carrier gas in the air gap with a swirl number > 0,5, preferably a swirl number > 1, more preferably a swirl number > 2.

20 30. An apparatus according to any one of claims 18 to 29, characterized in that the length of the drying chamber is at least 3.5 times longer than the diameter of the drying chamber.

31. An apparatus according to any one of claims 18 to 30, characterized in that the inlet for drying gas is provided with a filter substantially sterilizing the drying gas.